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PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO METHODS AND APPARATUS FOR MAKING COMPOSITE CIGARETTE MOUTHPIECE RODS

(71) We, BROWN & WILLIAMSON TOBACCO CORPORATION, a corporation organized under the laws of the State of Delaware, one of the United States of America, of 1600 West Hill Street, Louisville, Commonwealth of Kentucky, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates generally to the manufacture of cigarette filters, and in particular to a method and apparatus for making composite cigarette mouthpiece rods that are divisible into individual mouthpieces having a particulate component in line with other components.

Although attempts have heretofore been made to produce composite or multiple cigarette mouthpieces in which a central section is composed of loose adsorbent granules, for example, granulated charcoal, it has not been possible with prior apparatus and techniques to obtain the maximum desired fill. Even on a commercial scale, the fill obtained has ranged considerably less than 100%, and in many instances less than 70%. Although certain experimental attempts have produced fill of 90% or less, these have proved unacceptable, mainly because they resulted in an unclean product due to the presence of granules between the components and wrapper.

It is an object of the present invention to produce a clean composite cigarette mouthpiece rod having a loose particulate section of an optimum fill ranging from over 90% up to 100%.

To this end, the invention comprises a method of making composite cigarette mouthpiece rods that are divisible into individual mouthpieces having a particulate component in line with other components, said method comprising the steps of feeding said other components endwise in line, spacing these components a predetermined

[Price 25p]

distance from one another, partially enclosing them in a continuous first wrapper and in spaced relation to define a space between components of predetermined size with the first wrapper defining an opening along its top through which the particulate material may pass into the spaces between the spaced other components, providing a source of the particulate material, passing the partially enclosed components in the first wrapper beneath the source of the particulate material, introducing the particulate material into the space between the spaced other components through the top opening defined by the first wrapper, and completing the wrapping of the composite rod by sealing a second wrapper about the components and first wrapper and over the top opening, thereby forming a continuous composite rod.

The invention further comprises apparatus for making composite cigarette mouthpiece rods containing components of a selected material and each of which rods is divisible into individual mouthpieces for cigarettes with each of said mouthpieces including two parts of said components of selected material and an interposed particulate material section, said apparatus comprising means for feeding components of selected material, means for conveying said components to a first wrapping station, first wrapping means at said station for partially enclosing the components in a continuous wrapper and in predetermined spaced relationship with spaces between components of predetermined size and with the wrapper defining a top opening communicating with the spaces between components, a source of particulate material, means coupled with the source for introducing particulate material into the spaces between components, means for applying suction through the wrapper to expedite the filling of the spaces between components with particulate material, and means for completing the enclosure of the spaced com-

ponents and interposed particulate material with wrapping material to form a continuous rod.

In the practice of the present method, components of one material or character are fed in endwise and spaced relationship onto a moving conveyor. Components of the same or second material or character are similarly fed and placed between the first components. The interdigitated components of selected material or character are transferred onto a first wrapper moving on another conveyor travelling at a predetermined speed to provide a predetermined spacing of the components on the first wrapper. This wrapper is of a width slightly less than the circumference of the components and is at this stage wrapped around the bottom of the components and over a major portion of the circumferentially extending periphery of the components. Under these circumstances, a top opening is defined between the marginal side edges of the first wrapper and is in communication with the space of predetermined size between the components. In order to assure the predetermined spacing of the components relative to the first wrapper, they may be suitably bonded thereto. The partially wrapped components pass through a particulate material dispensing station at which the spaces between components are filled with this material through the top opening. In order to increase the rate of fill of the particulate material or if the nature of the material dictates to meet the desired production of the composite rod, suction is applied through the first wrapper below the discharge opening of the dispenser. This downward pull on the particulate material may be facilitated by rendering the wrapper porous. This may be done by pre-perforating the wrapper substantially along the longitudinal center thereof. Preferably, the perforations are formed on the machine and during the process at a location prior to the deposit of the components on the wrapper. The partially wrapped components and interposed particulate sections pass through a cleaning station and then into a second wrapping station at which a second wrapper of increased width is folded around the rod including the first wrapper and top opening. The marginal side edges of this wrapper are overlapped and suitably sealed together. The continuous rod is then subdivided into rods of the desired length which are then introduced into conventional filter tip attaching machinery for forming cigarettes with mouthpieces having two spaced components of selected material or character and interposed particulate section.

The foregoing and other features of the invention will become apparent from the following detailed description with reference

to the accompanying drawings, in which:

Fig. 1 is a view in side elevation of one form of the present apparatus as applied to a known composite filter making machine;

Fig. 2 is a fragmentary plan view approximately to scale of the first wrapper;

Fig. 3 is a similar view of the second wrapper;

Fig. 4 is a fragmentary top view of both wrapping stations and the interposed particulate material filling station;

Fig. 5 is an enlarged cross-sectional view taken along the line 5—5 of Fig. 4 showing the spaced components of certain character on the first wrapper prior to folding thereof;

Fig. 6 is an enlarged cross-sectional view taken along the line 6—6 of Fig. 4 showing the first wrapper folded about the spaced components;

Fig. 7 is an enlarged cross-sectional view taken along the line 7—7 of Fig. 4 showing the introduction of the particulate material in the first wrapper through the top opening thereof;

Fig. 8 is an enlarged cross-sectional view taken along the line 8—8 of Fig. 4 showing the filled inner or first wrapper superimposed on the second or outer wrapper prior to folding the latter about the inner wrapper and over the top opening defined thereby;

Fig. 9 is an enlarged cross-sectional view taken along the line 9—9 of Fig. 4 showing the outer wrapper completely folded with its overlapped marginal side edges suitably secured to one another;

Fig. 10 is an enlarged longitudinal sectional view through the present completely wrapped composite cigarette mouthpiece rod;

Fig. 11 is an enlarged fragmentary elevational view partly in section of the particulate material filling station;

Fig. 12 is an enlarged fragmentary cross-sectional view taken substantially along the line 12—12 of Fig. 1 illustrating the first wrapper folder;

Fig. 13 is an enlarged fragmentary cross-sectional view taken along the line 13—13 of Fig. 1 showing heating the marginal edges of the first wrapper to secure the components thereto;

Fig. 14 is an enlarged cross-sectional view taken along the line 14—14 of Fig. 1 illustrating the particulate material filling step;

Fig. 15 is an enlarged cross-sectional view taken along the line 15—15 of Fig. 1 showing the manner in which the second wrapper is applied and the folder therefor;

Fig. 16 is an enlarged cross-sectional view taken along the line 16—16 of Fig. 1 showing heating the overlapped marginal side edges of the second wrapper to secure these edges together;

Fig. 17 is an elevational view similar to Fig. 1 showing a modification comprising a perforating mechanism for perforating the first wrapper so that suction may be applied at the particulate material filling station for increasing the rate of fill of the spaces between components;

Fig. 18 is a view similar to Fig. 2 showing the perforated first wrapper which may also be supplied in this manner;

Fig. 19 is a view similar to Fig. 11 of the modified machine of Fig. 17 showing the particulate material filling station having a suction means incorporated therein; and

Fig. 20 is a cross-sectional view taken along line 20—20 of Fig. 19.

The present apparatus is illustrated as applied to a composite filter making machine of the type known commercially as Molins D.A.P.T.C. Machine and disclosed, for example, in British Patent Specification No. 915,203 and U.S. Patent No. 2,957,285. This machine, designated on the drawings by the general reference numeral 12, includes two hoppers 14 for mouthpiece components consisting of plug lengths made of paper, cellulose, cellulose acetate, cotton or other selected material.

Each hopper is provided with feeding devices 16 which are substantially identical with respect to one another. An individual feeding device comprising a drum having flutes on its periphery is disposed at the bottom of the associated hopper and is positioned to receive plug lengths in the flutes. The drum is provided with a number of circumferentially extending grooves into which rotating disc knives extend so as to subdivide each plug length into smaller separate individual lengths. An endless chain conveyor having pusher pieces is disposed beneath the drum so that as the drum rotates the pusher piece enters a flute so as to remove the cut plug lengths in a substantially continuous line. A guide associated with the trailing end of the chain conveyor serves to elevate the individual plug lengths, at which point a rotatable disc also provided with pushers is adapted to feed the raised plug length in an arcuate path onto a perforated suction conveyor band 18. The band picks up these plug lengths and retains them in place through the operation of the applied suction. This conveyor band is also timed with the pusher disc associated with the second hopper so that plug lengths delivered from this hopper enters the spaces between successive plug lengths carried to and disposed on the conveyor from the feeding device associated with the first hopper. Following the intermeshing or interdigitating of the individual plug lengths, they are arranged in substantially preset spaced relationship before passing through a particulate material filling and dual wrapping

attachment indicated by the general reference numeral 10 and forming a part of the present apparatus.

At this stage, the spaced components are transferred to the leading end of the particulate material filling and dual wrapping attachment 10 by a helical transfer drum 20. This drum 20 serves to transfer the spaced components over a stationary bridge 22 onto the web of an initial or first wrapper 24 which is suitably fed and supplied from a roll 26. This first wrapper is driven by a wrapper tape conveyor 28 at a predetermined speed in relation to the travel of the components deposited thereon to provide a predetermined spacing between components that has been selected for the length of the particulate material section.

The first wrapper 24 is of a width slightly less than the circumference of the components for purposes that will become apparent shortly, whereby a top opening 30 (see Fig. 6) is defined by the marginal side edges of the first wrapper folded about the lower circumferentially extending periphery of the spaced components. The material selected for the wrapper may be of a thermoplastic nature or selected from a wide variety of other materials including plastics, or paper, which will provide an essentially self-supporting rod prior to introducing the particulate material into the spaces between components. This will assure a uniform cross section of rod prior and subsequent to the filling operation.

The selected spacing of the components on the first wrapper 24 is maintained by an endless belt 32. A bar 34 thereafter continues to maintain this relationship as the first wrapper 24 and associated components are fed into a first wrapper folder 36. This folder 36 folds the first wrapper around the lower circumferentially extending periphery of the spaced components to form a partially wrapped rod having a cross section of the type shown in Fig. 6.

In the form shown in Fig. 1, a final or second wrapper 38 supplied from a roll 40 is also introduced with the first wrapper 24 and fed by the tape conveyor 28. The second wrapper 38 is disposed beneath the first wrapper 24 and over the tape conveyor 28. Both the tape conveyor web and the second wrapper web remain divergent and are not folded with the initial wrapper 24 by the folder 36.

The partially wrapped rod is now fed through a heater 42 which serves to fuse or otherwise suitably secures or bonds the spaced components to the thermoplastic initial wrapper 24. This securement may be at the marginal side edge portions of the first wrapper 24, as shown in Fig. 13, or may be throughout the entire associated surfaces of the first wrapper and com-

ponents. Where other than thermoplastic material is employed, the first wrapper may be suitably bonded to the components by an adhesive of a type well known to the trade.

5 The partially wrapped rod with secured components passes through a loose particulate material filling station 44. The filling station 44 includes a particulate material hopper 46 adapted to contain the selected
10 particulate material of predetermined proportion, form and characteristics at a regulated level. In this connection, a photo cell or other suitable level sensing device 48 of commercially available construction is
15 associated with the hopper 46 to sense the level of the particles therein. When the elevation of the particles falls beneath a predetermined level, the photo cell device will trigger a particle feed mechanism 50,
20 shown diagrammatically, to dispense particles into the hopper 46 to a certain level at which the particle feed will stop.

In this manner, a certain quantity of particulate material is assured in the hopper 46,
25 thereby maintaining a certain pressure at the base of the hopper from which the particles are dropped while under the influence of gravity into the space between the components. Under these circumstances, regulation of pressure will have the
30 effect of regulating the amount of particles and their compactness between components. The particles at the base of the hopper 46 are adapted to be dispensed through an elongated slot 52 defined by a bar 54. The
35 upper portion of the slot 52 is divergent in an upward direction, as shown in Fig. 14, to facilitate passage of the particles there-through. The lower edge 56 of the bar 54 has a radius, as shown in this figure, such as
40 to conform to the curvature of the wrapped upper side edge of first wrapper 24. Of course, sufficient clearance should be provided to permit free travel of the plug sections. The width of the lower end of the
45 slot 52 approaches the width of the top opening 30 defined by the first wrapper 24, thereby conforming the path of descent of the particles and assure their disposition between the spaced components. This dispensing operation may be further enhanced
50 by employing a vibration mechanism 58 and accordingly reduce any tendency of the particles forming undesirable masses, or clumps.

55 The filling station 44 is also provided with a powered rotary brush 60 which is adjustable in elevation and located at the downstream end of the hopper 46 to operate to clean off any surplus particles or particles that may be on the exterior of the
60 partially wrapped rod without affecting the particles within the confines of the spaces between components and the first wrapper 24. Of course, a vacuum or suction type of

cleaning device may be substituted and has been successfully employed in the present apparatus. A vacuum type cleaner or collector 62 is adapted to remove the excess particles from the bristles of the brush.

70 As will be apparent from Fig. 1, the tape conveyor 28 together with the second wrapper 38 are diverted in order to by-pass the filling station 44. Strategically located rolls may be employed for such purpose.

75 The partially wrapped rod is then fed into the second or final folder 64, which folds the second wrapper 38 completely about the rod in a manner depicted in Fig. 15. The marginal side edges of the second wrapper are in overlapped relationship completely embracing the exterior surfaces of the first wrapper 24 and closing the top opening 30. The overlapped marginal side edges of the
80 second wrapper may then be secured through the use of a seam paster of the type well known in the trade or through the use of a thermoplastic second wrapper and operation of heater 66 which fuses or bonds the overlapped edges together.

90 The completely wrapped rod is then passed through a conventional cut-off device 68 which operates to cut the dual wrapped filter rod into selected lengths. These lengths are subsequently placed in conventional filter-tip attachment machinery
95 adapted to secure composite mouthpieces on cigarettes which, as shown in Fig. 10, will include material A, particulate section and material B arrangement, where material B may be the same as or different from material A and may be the same or of unequal length. The particulate section may be of
100 different lengths depending on the material selected and requirements and may be selected from a wide variety of materials whether granular, powdered, flaked or flocculent, or combinations thereof, which may include but are not necessarily limited to charcoal, alumina, silica gel, appropriate
105 resins that may be modified or supplied with selected additives or other suitable filtering materials.

110 The physical nature of certain of the particulate materials may not lend themselves readily to the relatively high production speeds that can be attained with the present apparatus. With this in mind, a suction means may be incorporated at the particle filling station to increase the rate
115 at which the spaces between components are filled. This may be accomplished in the machine of the embodiment of Fig. 1 as illustrated in Fig. 17. The latter embodiment also serves to show the manner by which the second wrapper may be introduced subsequent to the filling of the spaces between components at the filling station. Accordingly, like parts will be similarly
120 numbered with accompanying primes. 130

Thus, the first wrapper of this embodiment is preferably porous or perforated, and may be initially supplied in this condition. On the other hand, the first wrapper may be perforated, as shown in Fig. 18, by the perforating mechanism 70. The perforations may be located between the marginal side edges of the first wrapper 24¹ along substantially the longitudinally extending centre or axis.

The partially wrapped spaced components leaving the folder 36¹ and heater 42¹ pass through particle filling station 44¹ which may have a hopper 46¹ of the construction of Fig. 11 or of the modified construction of Fig. 19. In the lower right end of the latter figure, it will be seen that the hopper is provided with a venturi chamber which increases the velocity of the particles travelling to the chambers' reduced end. The provision of this chamber across a major part of the length of the hopper keeps the weight of the particles in the hopper off the lower particles over most of the travelling rod. This is important in handling finer, flaked or flocculent types of particulate material. The side walls of the hopper may be provided with small openings, as shown, to provide air passages and to help agitate the particles in the hopper while under the influence of suction. As the spaces between components are filled, the particles are acted upon by suction pulled through the porous or perforated first wrapper 24¹ and emerging from the suction mechanism 72.

The filled partially wrapped rod is fed into the second wrapping station and onto the second wrapper 38¹ which is first introduced into the machine at this location. The feeding of the second wrapper 38¹ is facilitated by its own independent tape conveyor 74.

The completely wrapped rod is then fed through a cut-off device 68¹ and cut into desired lengths as in the previous embodiment.

WHAT WE CLAIM IS:—

1. A method of making composite cigarette mouthpiece rods that are divisible into individual mouthpieces having a particulate component in line with other components, said method comprising the steps of feeding said other components endwise in line, spacing these components a predetermined distance from one another, partially enclosing them in a continuous first wrapper and in spaced relation to define a space between components of a selected size with the first wrapper defining an opening along its top through which the particulate material may pass into spaces between the spaced other components, providing a source of the particulate material, passing the partially enclosed components

in the first wrapper beneath the source of the particulate material, introducing the particulate material into the space between the spaced other components through the top opening defined by the first wrapper, and completing the wrapping of the composite rod by sealing a second wrapper about the components and first wrapper and over the top opening, thereby forming a continuous composite rod.

2. The method of claim 1, comprising applying suction to the spaces between the other components as the particulate material is introduced therein to expedite the rate at which the particulate material fills the spaces.

3. The method of claim 1 or 2, wherein the other components are secured to the first wrapper prior to the introduction of the particulate material.

4. The method of claim 1, 2 or 3, comprising perforating the first wrapper along a line substantially midway between its longitudinal marginal edges as it is fed from its source of supply and before the spaced components are deposited thereon.

5. The method of any of the preceding claims, comprising feeding the second wrapper together with and under the first wrapper approximately as the components are deposited on the first wrapper.

6. The method of any of the preceding claims, wherein the second wrapper is separated from and diverted away from the partially wrapped component as the spaces are filled with particulate material and the second wrapper is subsequently united with the partially wrapped components prior to the second wrapping operation.

7. The method of any of the preceding claims, further comprising the step of cutting the completely wrapped continuous rod at intervals to produce individual rods each containing at least one particulate section.

8. The method of any of the preceding claims, wherein the other components are of double length, further comprising the step of cutting each of the components approximately at its centre to form individual mouthpieces each having a particulate section between the sections of the other components of different material.

9. A composite cigarette mouthpiece comprising spaced components of selected material and an interposed particulate material section, a first wrapper extending over a major part of the exterior circumferentially extending surface of the components and particulate material section but short of the entire circumferentially extending periphery of the components and particulate section and defining a top opening communicating with the space between components through which the particulate material was introduced, and a second wrapper

completely around the first wrapper and over the top opening to encase the particulate material in the space between the components.

5 10. The composite cigarette mouthpiece of claim 9, wherein one of the components is paper and the other is cellulose acetate.

10 11. The composite cigarette mouthpiece of claim 9 or 10, wherein the components are of unequal length.

12. The composite cigarette mouthpiece of claim 9, 10, or 11, wherein the first wrapper is porous.

15 13. Apparatus for making composite cigarette mouthpiece rods containing components of a selected material and each of which rods is divisible into individual mouthpieces with each of said mouthpieces including two parts of said components of selected material and an interposed particulate material section, said apparatus comprising means for feeding the components of selected material, means for conveying said components to an initial wrapping station, first wrapping means at said station for partially enclosing the components in a continuous wrapper and in predetermined spaced relationship with spaces between components of predetermined size and with the wrapper defining a top opening communicating with the space between components, a source of particulate material, means coupled with the source of introducing particulate material into the spaces between components, means for applying suction through the wrapper to expedite the filling of the spaces between components with particulate material, and means for completing the enclosure of the spaced components and interposed particulate material with wrapping material to form a continuous composite rod.

45 14. The apparatus of claim 13, wherein perforating means are provided for perforating the web of the wrapper substantially along the longitudinal centre thereof and at a location between its source of supply and the initial wrapping station.

50 15. Apparatus according to claim 13 or 14, including means for applying a second wrapper completely around the first wrapper and over the top opening to encase the particulate material in the space between the components and to produce a continuous composite rod having a section of particulate material between components of selected material.

60 16. Apparatus according to claim 13, 14, or 15, wherein said feeding means includes a pair of hoppers for rods of material of the selected certain material, a device associated with each hopper for cutting the rods to a certain length to form said components and feeding the components to the conveyor means, and means for interdigitating the

components from one hopper with those from the other hopper.

70 17. Apparatus according to claim 16, wherein the conveyor means includes a suction belt for receiving and conveying the rods in spaced interdigitated relation.

75 18. Apparatus according to any one of claims 13 to 17, wherein the first wrapping means includes a roll of the first wrapper material the web of which extends to the first wrapping station and is adapted to receive thereon the components conveyed by the conveyor means, and means for driving this web of the wrapper material at a selected speed related to the speed of the conveyor means to provide a selected predetermined space between components on the first wrapper.

85 19. Apparatus according to any one of claims 13 to 18, wherein the first wrapping means includes a folder which forms the first wrapper around the spaced components.

90 20. Apparatus according to claim 19, wherein the first wrapping means includes a hold-down means for holding the plugs down on the first wrapper at a location immediately before the folder.

95 21. Apparatus according to any one of claims 13 to 20, wherein the first wrapping means includes securing means for securing the spaced components to the first wrapper.

100 22. Apparatus according to claim 21, wherein the first wrapper includes thermoplastic material and the securing means is a heater for applying heat to the thermoplastic material and thereby bond the first wrapper to the components.

105 23. Apparatus according to any one of claims 13 to 22, wherein suction means are provided below the particulate dispensing means for applying suction through the first wrapper for increasing the rate at which the spaces between components are filled with the particulate material.

110 24. Apparatus according to any one of claims 13 to 23, wherein vibration means are associated with the dispensing means for vibrating the dispensing means to thereby optimize dispensing of the particulate material into the spaces between components.

115 25. Apparatus according to any one of claims 13 to 24, wherein cleaning means are provided adjacent the dispensing means for removing excess particulate material from the exterior of the partially wrapped components.

120 26. Apparatus according to any one of claims 13 to 25, wherein means are provided for folding the first wrapper about the spaced components independently of the folding of the second wrapper about the components at substantially the location of the first wrapping means.

125 27. Apparatus according to any one of claims 13 to 26, wherein means are pro- 130

5 vided for diverting the second wrapper away from the first wrapper and the suction means as well as the particulate material dispensing means and then subsequently superimposing the second wrapper under the partially wrapped rod substantially at the location of the second wrapping means.

10 28. A method of making composite cigarette mouthpiece rods substantially as hereinbefore described with reference to the accompanying drawings.

29. A composite cigarette mouthpiece rod substantially as hereinbefore described

with reference to the accompanying drawings.

30. Apparatus for making composite cigarette mouthpiece rods substantially as hereinbefore described with reference to the accompanying drawings.

15

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FIG. 1

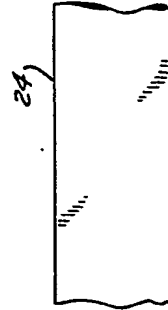
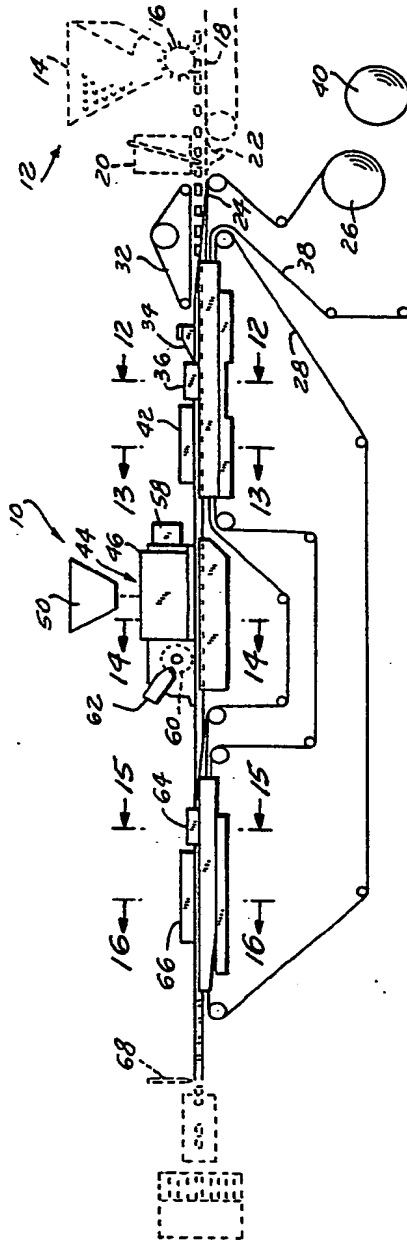


FIG. 2

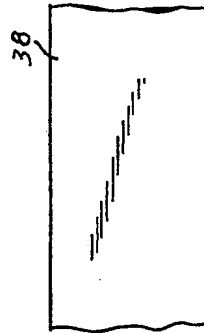


FIG. 3

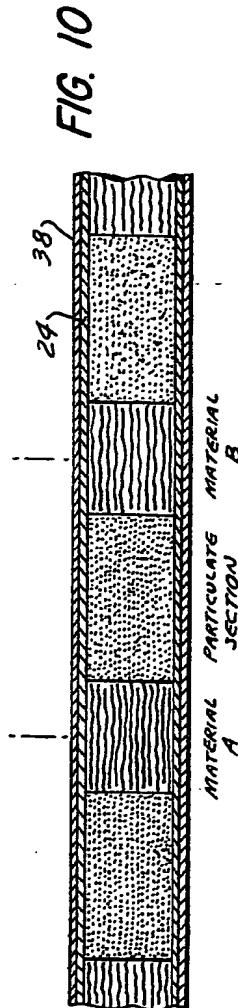
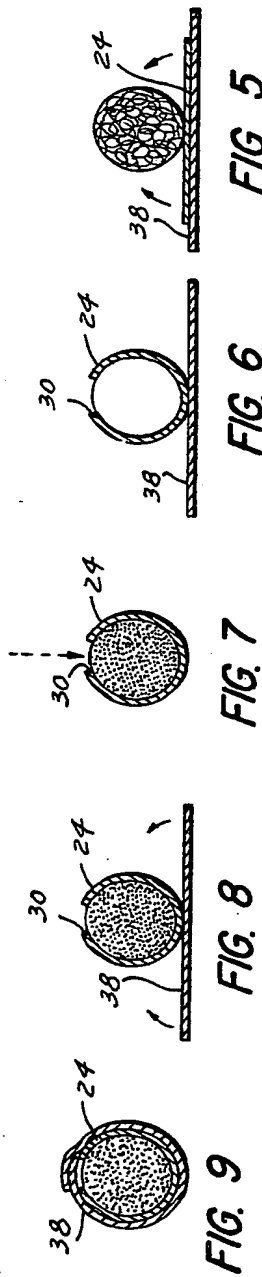
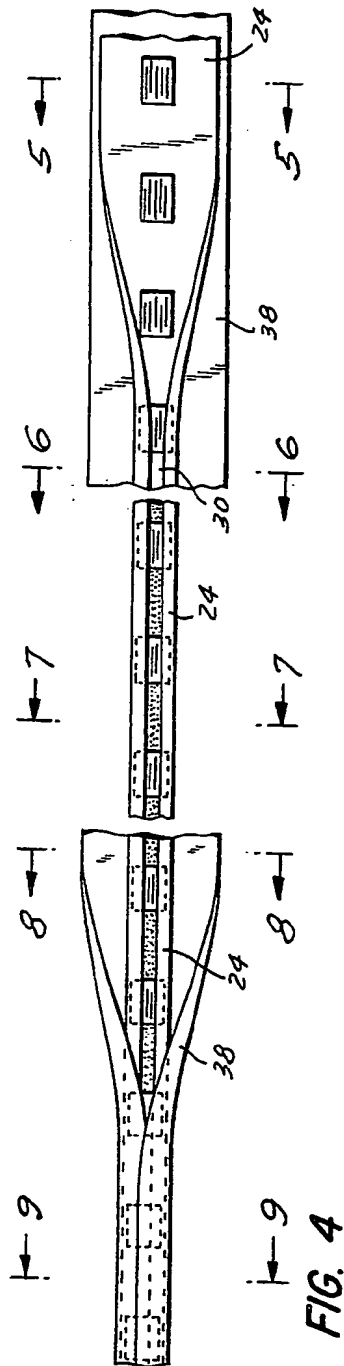
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Sheet 2



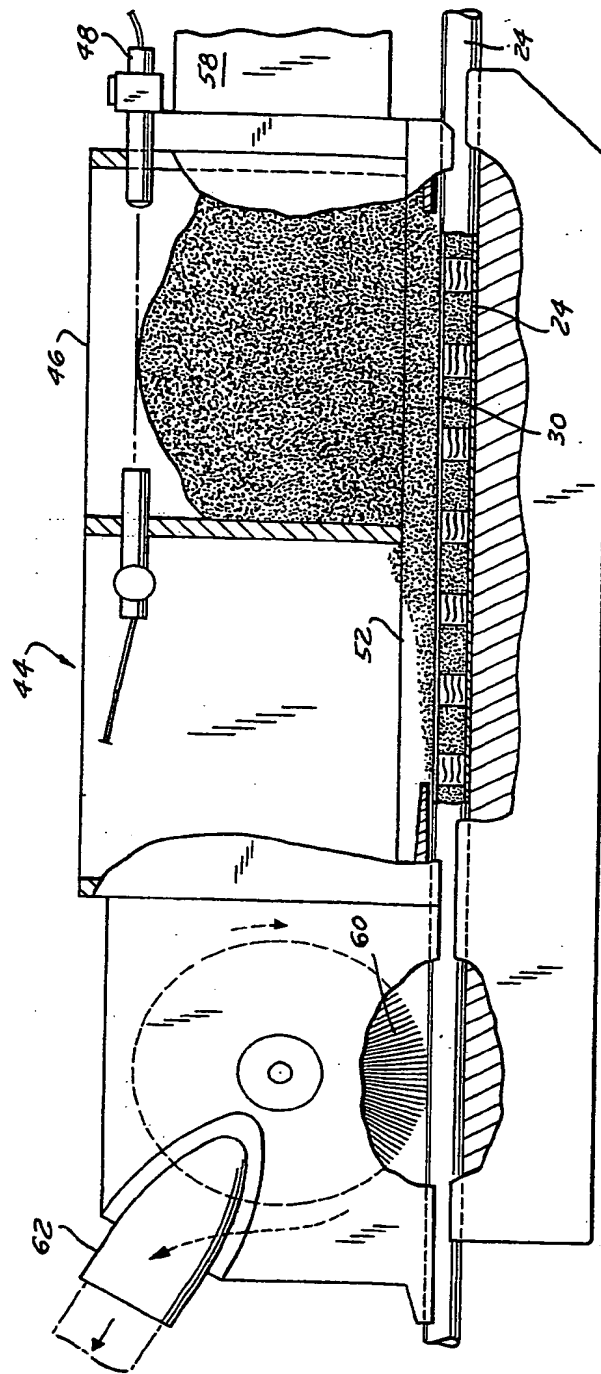


FIG. 12

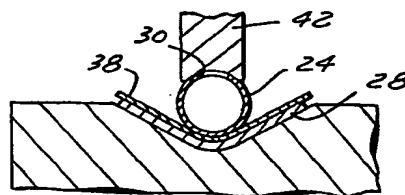
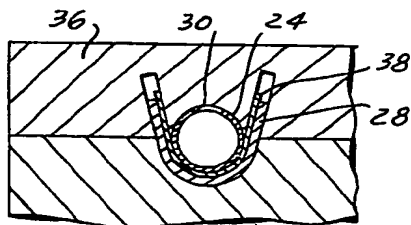


FIG. 13

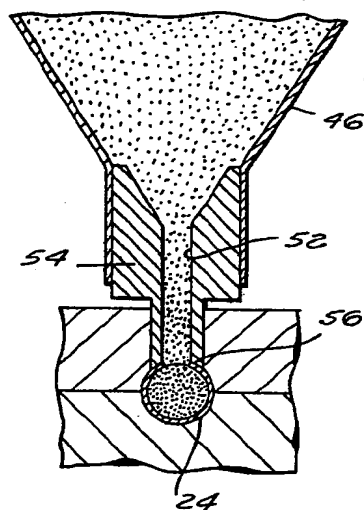


FIG. 14

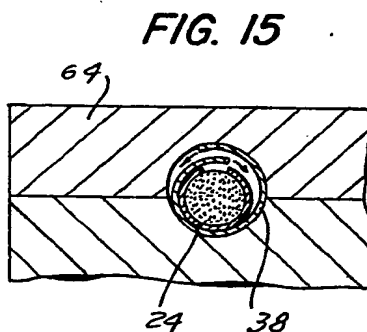


FIG. 15

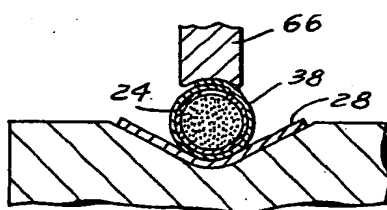


FIG. 16

FIG. 17

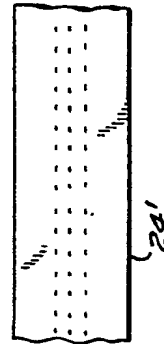
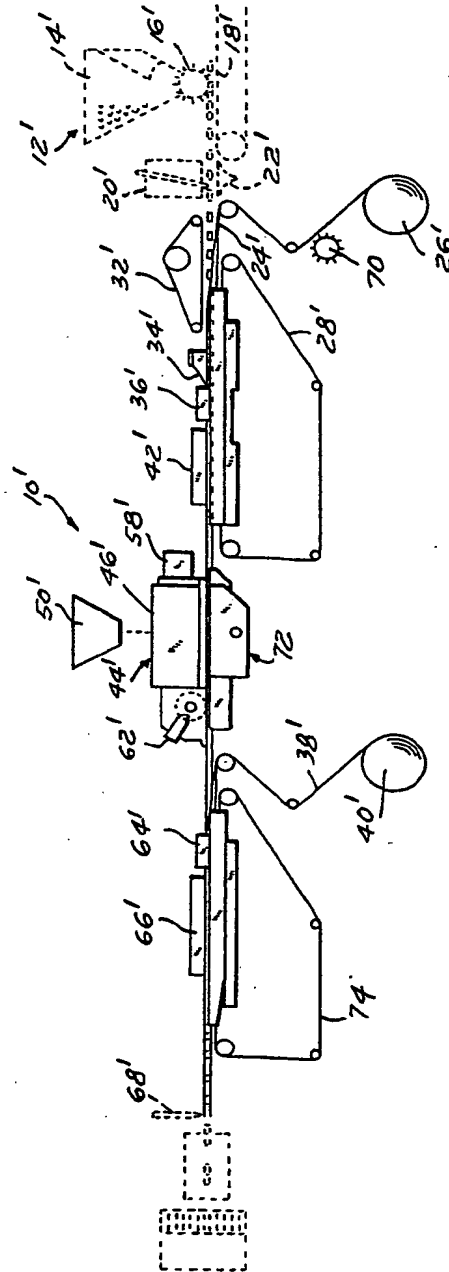


FIG. 18

